instrumental errors. The wind movement is measured by Robinson anemometers, assuming the factor 3. The amount of cloud is given in tenths of the whole sky; the lower clouds are for the most part fracto-stratus; the middle clouds cumulus, and the upper clouds cirrus or cirro-stratus.

The observations at 7 a. m. and 3 p. m. at Kingston and Hill Gardens are also communicated in detail by Mr. Hall, but are not published at present, although eventually this may be done, as Hill Gardens is, like Blue Mountain, an interesting mountain station, for comparison with its near neighbors, Castleton Gardens and Kingston. The direction of the wind at the upper station is only given in general terms for the day, and is, in general, east-southeast, while at Kingston it is south-southeast.

The general direction of the middle clouds, as observed at 7 a. m. and 3 p. m., at Kingston, is southeast, but the velocity at the upper station is so much less than at the lower, viz, 19 miles as compared with 119, that one must infer that the upper station is greatly sheltered from the free wind by the summit of the hill above it which is said to attain an attitude of about 6,300 feet. If a mountain summit station can be obtained this also will be published. Many details with regard to the climate of Jamaica will be found in Mr. Hall's contributions to the official handbook published by the Government of that island in 1881.

The important mutual relations between the meteorology of the West Indies and the southern portion of the United States must stimulate the study of these records from Jamaica.

Jamaica, W. I., climatological data, June, 1897.

	Morant Point Lighthouse.	Negril Point Lighthouse.	Kingston.	Kings House.	Castleton Gardens.	Hope Gardens.	Stony Hill Reformatory.	Hill Gardens (Cin. Plant).
Elevation (feet)	8	33	50	400	580	600	1,400	4,907
Mean barometer 7 a.m.	....	29.940	29.955	.....	.....	.....	.....	25.253
Mean barometer 3 p.m.	.....	29.912	29.907	.....	.....	.....	.....	25.222
Mean temperature 7 a.m.	.....	79.2	79.3	74.5	73.0	74.3	73.0	63.5
Mean temperature 3 p.m.	.....	83.3	86.5	88.1	84.5	86.7	81.6	67.6
Mean of maximum	.....	87.6	89.1	92.5	89.1	89.9	84.8	71.0
Mean of minimum	.....	73.0	74.5	67.6	64.7	69.5	67.8	59.0
Highest maximum	.....	90	92	98	92	95	89	76
Lowest minimum	.....	71	72	65	62	68	66	57
Mean dew-point 7 a.m.	.....	72.3	70.0	70.8	69.8	69.9	69.0	58.8
Mean dew-point 3 p.m.	.....	79.5	71.4	75.8	71.4	71.6	73.6	62.2
Mean relative humidity 7 a.m.	.....	75	73	87	90	87	87	83
Mean relative humidity 3 p.m.	.....	78	61	67	62	61	77	81
Monthly rainfall (inches)	4.80	5.58	0.58	0.54	4.31	1.10	2.45	0.91
Average daily wind movement	.....	225.8	119.0	.....	.....	.....	.....	18.6
Average wind direction 7 a.m.	.....	n. e.	n.	.....	.....	.....	.....	.....
Average wind direction 3 p.m.	.....	var.	s. e.	.....	.....	.....	.....	.....
Average hourly velocity 7 a.m.	.....	6.5	1.4	.....	.....	.....	.....	.....
Average hourly velocity 3 p.m.	.....	12.2	9.2	.....	.....	.....	.....	.....
Average cloudiness:								
7 a.m. Lower clouds	.....	0.7	0.5	.....	.....	.....	.....	.....
7 a.m. Middle clouds	.....	0.6	0.8	.....	.....	.....	.....	.....
7 a.m. Upper clouds	.....	5.9	3.6	.....	.....	.....	.....	.....
3 p.m. Lower clouds	.....	5.6	1.0	.....	.....	.....	.....	.....
3 p.m. Middle clouds	.....	2.6	1.2	.....	.....	.....	.....	.....
3 p.m. Upper clouds	.....	0.5	3.6	.....	.....	.....	.....	.....

HOT WINDS IN MISSOURI.

The voluntary observer, George Comly, at Willow Springs, Howell Co., Mo. (N. 37° 00′, W. 91° 55′), under date of June 25, writes:

At 5:40 a. m. (probably central time) to-day, an exceedingly hot wave struck this place, lasting forty minutes, from the west, causing a rise in temperature of 20°, rising from 65° to 85° at 6:15, then going down again to 68° at 7 o'clock.

Somewhat similar occurrences have been recorded, not only over the greater portion of the Mississippi watershed, but in other parts of the world. At the time noted by Mr. Comly, Missouri and the adjacent country was covered by an area of cloud and rain. Northerly winds prevailed from northern Missouri to Canada, and southerly winds prevailed from southern Missouri to the Gulf. A temperature of 65° F. prevailed to the north of Willow Springs, and a temperature of 80° prevailed at Little Rock and Fort Smith, or about 150 miles to the South. But a temperature of 85° does not appear in any region near by. It is not necessary to suppose that the hot wave observed by Mr. Comly was due to the strictly horizontal movement of hot air from some distant point. Such a motion, at the rate at which the wind was then blowing, or scarcely 10 miles an hour, would have consumed at least ten or fifteen hours to pass over the intervening territory, and would have been observed by many others besides Mr. Comly. The explanation of these local hot winds has been frequently given in connection with the Foehn winds of Switzerland, of Table Bay, the dry chinook of Montana, and the hot winds of Kansas. Any comparatively small mass of air that is rapidly descending warms up by compression faster than it can cool off by radiation, and when it reaches the earth's surface spreads out as a local hot wave. If the upper air is moving from the west and sends a portion down to the earth's surface, the latter will appear as a hot wave moving from the west. This descent and hot wave may occur at any time, morning, noon, or night, and at any season of the year, summer or winter, and is the proper explanation of many of the phenomena of oppressive hot weather that accompany thunderstorms, tornadoes, and all such storms as have their origin in rapid vertical movements, which have been called topsy-turvy movements by Chambers in his analysis of the climate of Madras. At Cape Town, South Africa, where a heavy southwest wind, blowing over Table Mountain, descends in whirling gusts upon the town and the bay, the Editor, in 1890, observed quite accurately and on many days at certain hours, the rapid movement of alternate gusty streaks of hot, dry, and cold, moist air. The latter streaks represented the air that had passed around the mountain or was resting quietly over the bay, while the hot streaks represented air that had descended rapidly from the top of the mountain, and which blew violently at the topmast of the vessel two or three seconds before it reached the observer on deck. The measured alternations of temperature were plus or minus 4° F. in three minutes of time, but owing to the internal sluggishness of the best thermometers it is certain that the actual alternations of temperature were much greater, and, in fact, the sensations of feeling seemed to the observer to correspond to sudden changes of at least 10°.

In thunderstorms of that class which consist of an advancing roll of air rising in the front and descending in the rear, one will almost always notice the sensation of heat for a short time after the storm has passed, and before the mass of cool, dry west wind has succeeded in pushing the thunderstorm area entirely away.

HOT WINDS IN KANSAS.

Mr. P. A. Pearson, postmaster at Kinsley, Kans. (N. 37° 50′, W. 99° 20′ and, therefore, about 30 miles east-northeast of the regular Weather Bureau station at Dodge City), communicates the following note:

On June 23, about 12:30 a. m., an oppressive hot wind from the northwest prevailed. One who faced the wind had to gasp for breath. After a few seconds there would be a calmness that can only be described as a deathly stillness, no less oppressive than the wind. At 1:20 a. m. the thermometer registered 94°; at 1:38, 91°; at 1:50, 80° F. I have no doubt but that the temperature between 12:30 and 12:40, when it was at its maximum, was as high as 115° or 120°.

There was a heavy bank of cloud southwest of Kinsley and I am of the opinion that a cyclone (tornado?) passed high above us. The board sidewalks were so hot that they burned the bare feet of those who stepped on them about the same as if in the hot sunshine of midday.

The local newspapers at Larned, Kans. (N. 38° 10′, W. 99° 5′, therefore, about 25 miles northeast of Kinsley), says:

On Tuesday night between 2 and 4 a. m., that is to say, Wednesday, June 23, many people were awakened about 2 a. m. by the extraordinary heat of the air, it being so intense that many thought their houses to be on fire; those who noticed the direction in which the hot wave was moving say it came from the southwest to the northeast and then came back from the northeast to the southwest. A pleasant cool breeze from the north had been blowing up to 1 a. m. that night and it commenced again to blow about 5 a. m.

The 8 a. m. weather map of the 23d shows mostly southerly winds, clear sky, and falling barometer in Kansas; so that a local northerly wind at Larned would imply a local topsy-turvy movement such as would characterize a streak of hot winds extending from Kinsley to Larned.

BRIGHT METEOR.

A bright meteor passed over Augusta, Kans., on June 20, about 10:45 p. m. (probably central time) traveling due west. Two or three minutes after passing over there was a loud explosion like a heavy clap of thunder. The color of the meteor was bright blue.

In addition to the preceding report received directly from the postmaster at Augusta (long. 96° 57′ W., lat. 37° 40′ N.) there have been received newspaper reports from other stations, as follows:

Eldorado, Kans. (N. 37° 44′, W. 97° 50′)—Path from west to east; principal meteor followed by a number of smaller lights; heavy explosive noise from two to four minutes after the meteor disappeared.

Wichita, Kans. (N. 37° 40′, W. 97° 20′)—Appeared at 10:50 in the southeast at an altitude of about 60°; path toward the northwest where it disappeared on the horizon like a bright glowing coal, passing near the zenith; two minutes afterwards there was a sharp heavy report that died away in a low rumbling sound. Persons living 17 miles to the northwest (lat. 37° 50′, long. 97° 33′) saw it fall.

Winfield, Kans. (N. 37° 15′, W. 96° 58)—Brilliant meteor athwart the sky about 11 p. m., followed by a rumbling noise.

Hutchinson, Kans. (N. 38° 3′, W. 97° 56′)—Meteor of great brilliancy at 10.45. Apparent path from east to west.

Emporia, Kans. (N. 38° 53′, W. 96° 8′)—Enormous meteor passed over the city about 11 p. m., disappearing in the southwest.

Ardmore, Ind. T. (N. 34°, 10°, W. 97°, 5′)—Just before 11 p. m. a large meteor appeared in the northeast and apparently struck the earth in the northwest; it appeared as large as the moon and gave a light almost equal to that of day.

From these few reports, elementary as they are, we can only conclude that the meteor must have been moving nearly east and west when first seen. It must have been at least 5 miles above the surface of the earth since it was visible from Ardmore, which is about 210 miles south of the vertical plane through its path. But the record at Ardmore shows that it appeared to pass from northeast to northwest, and, if this is strictly true then its path must have been from the northeast toward Kansas, where it turned westward and eventually northwestward and its height above the ground, when passing over the stations in Kansas, must have been at least 30 or 40 miles. If numerous other and more accurate observations can be secured, it will be worth while for those interested in meteors to compute more accurately the path of this body. In general, of course, we know that a myriad of such masses, large and small, are moving swiftly through the space between the earth and the surrounding stars, and we see only those that for a few seconds pass into our own atmosphere. To the meteorologist these objects have considerable interest, as they reveal the presence of a considerable quantity of air at the height of 50 miles above the earth, where the barometric pressure would be less than 0.001 of an inch, and would, therefore, be called inappreciable in our ordinary terrestrial meteorology. Notwithstanding the thinness of the atmosphere at this elevation, we see that an immense noise can be produced in it and propagated through it. The violence of the atmospheric concussion is, in fact, inconceivable; if we try to reproduce it by the mechanical production of sound inside of a vessel from which the air has been exhausted, we shall find it impossible to do so. The intensity of a sound as it passes from a lighter to a denser medium experiences an apparent diminution. As our lower atmosphere is more than thirty thousand times as dense as that in which the meteor made its tremendous noise, so the latter must have been thirty thousand times as intense as the noise of the explosion heard by the observers in Kansas.

METEOROLOGICAL TABLES.

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For text descriptive of tables and charts see page 166 of REVIEW for April, 1897.